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REFUSE COLLECTION AND DISPOSAL, AN ANNOTATED BIBLIOGRAPHY, 1956-1957. SUPPLEMENT C

Edward R. Williams

Public Health Service
Cincinnati, Ohio

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REFUSE COLLECTION AND DISPOSAL

An Annotated Bibliography

1956 - 1957

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
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REFUSE COLLECTION AND DISPOSAL

an annotated bibliography
1956 - 1957

By
Edward R. Williams

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
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National Center for Urban and Industrial Health
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P R E F A C E

This supplement covers the period 1956-1957, and is arranged in sections which correspond to the various administrative and operational phases of the broad field of refuse collection and disposal. As in Supplement B, the references have been annotated for increased usability as an aid in the exchange of information in both the research and operational phases of refuse sanitation activities.

SELECTED REFERENCES

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SELECTED REFERENCES IN THE FIELD OF REFUSE COLLECTION AND DISPOSAL

A. REGULATIONS (including Laws and Ordinances)

Anonymous:

1. CHAPTER VIII ADDED TO STATE SANITARY CODE EFFECTIVE July 1, 1958: Public Health News, 38:6:203, June 1957.

   State Board of Health of New Jersey approves resolution requiring the disposal of community solid wastes by either sanitary landfill or incineration effective July 1, 1958, the standards promulgated for the implementation of the measure are included.

2. POPULACE BACKS LOCAL AND STATE ANTI-LITTER LAWS: The American City, 71:7:209, July 1956.

   Brief report of a Gallup poll which showed 86% of the American people think litterbugs should be fined to the full extent of the law. The report states that more than 40 states now have anti-littering laws.

3. WHEN IS A DUMP A NUISANCE: Public Works, 88:8:77, August 1957.

   A damage suit against the city of Reno, Nevada for alleged nuisances caused by the operation of a dump is decided in favor of the city. The ruling affirmed, by the Nevada Supreme Court, was made on the basis that a dump is not a nuisance per se, but can become one as a result of its location or the manner in which it is operated.

Banyasz, John L.

4. REGULATION AND CONTROL OF OPEN BURNING: Public Health News, 37:7:233, July 1956.

   A report on the implementation of "Air Pollution Control Act (1954)" adopted by New Jersey as it pertains to the regulation and control of open burning. The allocation of smoke and odor from open burning dumps is described as the logical starting point in a program to minimize the four major categories of air pollution in New Jersey. Included are the pertinent State statutes, an outline of the current enforcement program, methods of procedure, and a discussion of the problems encountered.

Geisheker, B. J.

5. FLY-ASH EMISSION LIMITS AND STANDARD TEST METHODS FOR MUNICIPAL INCINERATORS: Public Works, 88:9:151-152, September 1957.

Fly ash standards specified in ordinances from 61 cities are outlined. The typical relationship of municipal refuse incinerators to current standards is discussed. Development of a new set of test procedures and limitation criteria for municipal incinerators is recommended.

(Regulations - laws and ordinances)

SEE ALSO NOS. 24, 41, 57, 63, 67, 95, 133, 147.

B. FINANCES (including Costs, Fees, Taxes, etc.)

Anonymous:

6. COLLECTION AND DISPOSAL OF GARBAGE AND REFUSE: Public Works, 87:11:122, November 1956.

Raleigh, North Carolina reports that services rendered by sanitation department are most extensive and expensive of any of the services given by the city government (about $4.15 per capita per year).

7. DATA ON REFUSE COLLECTION AND DISPOSAL FROM CINCINNATI: Public Works, 88:10:170, October 1957.

An abstract from the 1956 annual report of the Waste Collection Division. Included are data on various types of collection vehicles and costs. Cost of combustible refuse collection was reported to be $8.75/ton, $2.53 per capita; noncombustibles $3.21/cu. yd., $.95 per capita; cost of combustible refuse disposal by incineration was $2.22 per ton, $.89 per capita.

Ervien, H. G.

8. PERFORMANCE BUDGETING -- ITS VALUE AND SHORTCOMINGS: The American City, 72:3:129, March 1957.

Albuquerque, New Mexico reports successful adoption of performance budgeting for control of operating costs. The Department of Sanitation has made a compilation of lump sum costs (salaries, expenses, and capital improvements). For their 175,000 population, the cost for refuse disposal is $4.60 per capita per year. The sanitary landfill method of disposal is used. Reported costs are as follows:

B. FINANCES (including Costs, Fees, Taxes, etc.) contd.

Item	Quantity (Tons)	Cost	Cost/Ton
Collection	63,945	$512,200	$8.01
Hauling	"	275,200	4.30
Disposal	"	28,136	0.44
TOTAL	63,945	$815.536	$12.75

(Finances - costs, fees, taxes, etc.)

SEE ALSO NOS. 13, 19, 20, 22, 33, 35, 44, 52, 53, 55, 58, 69, 89, 99, 126, 129, 147, 155, 157, 162.

C. STORAGE (including Methods and Equipment)

Anonymous:

9. OAKLAND PARKS USE CARDBOARD TRASH CONTAINERS: The American City, 71:5:27, May 1956.

A brief report on the Oakland, California Park Departments use of light weight colorful cardboard trash containers. The containers are placed in a metal frame. They are usually in use three or four weeks before requiring replacement.

10. REFUSE COLLECTION COST CUT --SERVICE IMPROVED: Public Works, 88:6:103, June 1957.

Hartford, Connecticut reports increased refuse collection service and reduced per ton costs for disposal, mainly through the purchase of new, larger compaction type collection trucks. The cost of refuse collection per ton was $10.72 in 1954-1955, $9.66 in 1955-1956, and a further decrease is expected for the 1956-1957 period. The refuse from the 183,000 population ranges from 160 to 250 tons per day and is disposed of by both incineration and sanitary landfill.

Barnes, W. R.

11. BIG CONTAINERS, BETTER COLLECTION: The American City, 71:5:114, May 1956.

An account of Augusta, Georgia's program to modernize their refuse collection and disposal methods. Starting in 1953, the sanitary landfill method was instituted and compactor type collection vehicles were obtained. Large portable-type containers were found especially useful in commercial areas.

(Storage - methods & equipment) contd.

SEE ALSO NOS. 11, 33, 44.

D. COLLECTION AND DISPOSAL - GENERAL

Anonymous:

12. LOS ANGELES PLANS CITY-WIDE RUBBISH COLLECTION: Public Works, 87:7:132, July 1956.

    Based on experience obtained in a pilot study in the harbor area, The City of Los Angeles plans to provide city-wide combustible rubbish collection by October 1, 1957. Included is data on costs ($3, 363, 905 for the first year's operation including cost of trucks and equipment, and yard facilities) information on several schemes submitted by private contractors and the projected effect on the Los Angeles air pollution problem.

13. PLANNING REFUSE DISPOSAL FOR A METROPOLITAN COUNTY: Public Works, 88:9:103-105, September 1957.

    An abstract of an engineering report prepared for Bergen County, New Jersey; included are data on refuse collection costs, local collection practices, per capita quantities of refuse, financing background, and other local data. Recommendations included construction of two transfer stations in county in near future and use of sanitary landfill method.

14. REFUSE DISPOSAL IN TENNESSEE: The American City, 72:6:36, June 1957.

    This is a brief report of a survey by the Tennessee State Planning Commission listing data on collection and disposal practices in 144 (56%) of Tennessee's incorporated cities. For disposal 36% of the cities used open dumps, 22% sanitary landfills and 1% incineration. Seven percent reported no refuse collection service provided in the city.

15. REFUSE SANITATION STUDY GROUP: The American City, 72:3:212, March 1957.

    The Public Health Service is convening an Ad Hoc Study Group to consider the problem of community solid waste disposal. The article enumerates the aims of the meeting and gives the names of individuals and organizations invited.

D. COLLECTION AND DISPOSAL - GENERAL (contd.)

Anonymous:

16. THE LITTERBUG IS ON THE MOVE: Public Works Engineers Newsletter, 23:5:6, November 1956.

A report of the gaining momentum of anti-litter campaigns across the nation. Brief reports of activity at New Haven, Connecticut; Chicago, Illinois; Milwaukee, Wisconsin; Louisville, Kentucky; Nashville, Tennessee; are included. The function of the organization "Keep America Beautiful" is outlined.

American Public Health Association:

17. HOSPITAL SOLID WASTES AND THEIR HANDLING: Report of Committee on Hospital Facilities in American Journal of Public Health, 46:3:56, March 1956.

The report outlines the public health implications of hospital wastes handling, the necessity for planning for handling these wastes, and defines the various types of wastes produced in hospitals. Data based on a survey of 29 hospitals is reported including (1) the total amounts of solid wastes produced by hospitals; (2) how wastes are handled within the hospital's internal organization; (3) how they are ultimately disposed of.

American Society of Civil Engineers:

18. INVESTIGATION OF PLANNED REFUSE COLLECTION AND DISPOSAL: Journal of the Sanitary Engineering Division NO. SA3, June 1956, Paper 1014.

This is a summary of a report of the same title prepared by the Los Angeles County Sanitation Districts. It includes comprehensive data on classification of refuse, factors affecting collection, results of a survey of relative costs for refuse collection, the nature and quantity of refuse and a discussion of refuse disposal processes including landfill, transfer and haul, incineration, garbage feeding to hogs, garbage grinding, salvage, composting and the potential of grinding rubbish for disposal through the sewer system.

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D. COLLECTION AND DISPOSAL - GENERAL (contd.)

American Society of Civil Engineers:

19. STATUS OF REFUSE COLLECTION AND DISPOSAL: Proceedings of the ASCE, Journal Sanitary Engineering No. SA1, 83:1176-1, February 1957.

Results of a survey by the Sanitary Engineering Research Committee, Refuse Section are summarized and evaluated. Article concerns the present status of refuse collection and disposal as well as future needs for additional research and development in this field. Topics included are: current research investigations, need for further research, general suggestions for refuse research, costs, salvage, refuse collection and transfer, sanitary landfill, water carriage, composting, incineration, and animal feed and ocean disposal of refuse.

Arthur, G. B.

20. ENGINEERING SOLVES THE REFUSE PROBLEM: Public Works, 87:4:116, April 1956.

A comprehensive report of how Atlanta, Georgia collects and disposes its refuse. Included is data on the number and time per pickup (4 minutes/unit), equipment, regulation and licensing of private collectors, and a description of the operation of a voluned type incinerator. In regard to the latter costs and methodology of utilization of the waste heat produced for generation of steam and salvage of tin cans and other metals is outlined. Successful use of the incinerator ash as a paving medium is described, and reliance on landfills for peak loads in June, July, August, and December, and their satisfactory operation on a year-round basis for dry materials is related.

21. THE HIGHWAY LITTERBUG COSTS MILLIONS: Public Works, 88:3:119, March 1957.

The multi-million dollar cost of removing litter from highways is emphasized. Clean highway programs in several southern states are described in some detail. It is concluded that considerable additional public education and program planning efforts by the various states is needed as well as increased activity by volunteer groups such as civic organizations, women's clubs, etc.

D. COLLECTION AND DISPOSAL - GENERAL (contd.)

Blondell, Neil

22. GROSSE POINTE OFFERS ADVANCED REFUSE SERVICE: The American City, 72:1:110, January 1957.

A description of the Grosse Pointe, Michigan collection system wherein the city uses burlap bags at each residence and provides basement pickup service at $5.93 per capita per year. Salvage and dump operating difficulties are briefly described.

Bright, John H.

23. MEETING OF THE U.S.P.H.S. AD HOC STUDY GROUP ON COMMUNITY SOLID WASTE COLLECTION AND DISPOSAL, MARCH 14-15, 1957, AT WASHINGTON, DC: The Sanitarian, 19:6:274, May-June 1957.

Delineation of the over-all refuse problem and conclusions reached by this group concerning needed action to aid in designing refuse collection and disposal systems on a scientific basis.

Bulliung, A. M.

24. GARBAGE DISPOSAL ALONG THE NEW ORLEANS WATERFRONT: The Sanitarian, 18:3:136, November-December 1955.

Report of a survey to determine method and means of garbage disposal from ships calling at the port of New Orleans. Legal basis for federal controls (USDA, USPHS, and US Coast Guard) as well as State and local controls are outlined and satisfactory methods presently in use are reviewed.

Chase, Arthur

25. PARKY CLEANUP BOOSTER BRINGS PARKLIKE CITIES: The American City, 72:5:155, May 1957.

A cleanup conscious kangaroo named "Parky" is being used as a litter prevention symbol by over 200 municipalities throughout the U.S. and Canada to spearhead cleanup campaigns. Its success in Los Angeles, California is described where use is made of posters, auto decals, a theme song and other reminders against litter. The article provides information by which other municipalities may start a similar campaign.

D. COLLECTION AND DISPOSAL - GENERAL (contd.)

Critchley, H. F.

26. PUBLIC CLEANSING: PRESENT PROBLEMS AND FUTURE TRENDS: Royal Society for the Promotion of Health Journal: 77:9:559-565, September 1957.

A review of the extent and scope of public cleansing services in England during the past 50 years. Included are discussions of refuse composition and quantity, containers, vehicles, staff, disposal methods, and future trends in each area.

Dodsworth, E.

27. THE CHALLENGE TO PUBLIC CLEANSING: The Sanitarian (England), 65:2:121, November 1956.

A paper reviewing the immediate problems and possible developments in the field of public cleansing. Included is consideration of labor problems, incentives, dust bin improvements, and field investigation results thereto. Also included is a discussion of the development and utilization of land reclamation methods by controlled tipping.

Eagle, G. H., and Overman, S. M.

28. GOOD REFUSE SANITATION IS NOT IMPOSSIBLE: Public Works, 87:12:83, December 1956.

This is a comprehensive review of recent developments and trends in Ohio. Included are data on use and adoption of municipal systems of collection (40 in 1950, 69 in 1956), the sanitary landfill (12 in 1950, 61 in 1956) and other methods of disposal. Problems of disposal in large cities, small villages, and counties are reviewed. The need for leadership and Ohio's program of refuse clinics for municipal officials are described. Examples of communities which have satisfactorily attacked this problem are listed as Maple Heights, Delaware, Westerville, and Stark County.

Fannon, William P.

29. BALTIMORE'S CONTINUAL "CLEAN CITY" CAMPAIGN: The American City, 72:4:107, April 1957.

The successful results of a nine year old continuous intensive clean city program in Baltimore are reported. Described is use of incentive systems and schools for employees cooperation with the city's Division of Planning and the Police Department as well as utilization of civic groups including a special "Clean-Up Charlie Club."

D. COLLECTION AND DISPOSAL - GENERAL (contd.)

Geisheker, B. J.

30. PROGRESS IS THE KEY: The American City, 71:12:82, December 1956.

An account of the 46 year history of the development of incineration and refuse collection methods at Milwaukee, Wisconsin.

Guider, Carl H.

31. A 40-YARD TRANSFER TRUCK-AND-TRAILER: The American City, 72:3:15, March 1957.

Detroit has developed an efficient way to relay refuse to outlying disposal points 28 miles away by use of 40 cubic yard transfer trucks and trailers. They previously used 28 cubic yard semi-trailers.

Hodgson, H. J. N.

32. CITY REFUSE DISPOSAL AND UTILIZATION: Royal Society For the Promotion of Health Journal, 77:4:196, April 1957.

A summary of a report prepared for the south Australian government based on the authors study tour in Great Britain, Europe, and America, in 1954. Discussion of trends includes practice in England, Scotland, Ireland, France, Holland, Germany, Denmark, and the U. S. General conclusions indicated sanitary landfills is the most widely used method of refuse disposal.

Hope, M. C., Johnson, C. C., Jr., Weaver L.

33. REFUSE HANDLING PRACTICES IN THE UNITED STATES: Public Health Reports, 71:2:204, February 1956.

A summary report on refuse storage, collection, and disposal practices in 1,273 cities in 30 states, 1951-54. Discussion includes reports on adoption of storage regulations, separation requirements, types and size of containers, frequency of collection, point of collection, responsibility for collection, types of vehicles, methods of financing and disposal practice.

D. COLLECTION AND DISPOSAL - GENERAL (contd.)

Hope, M. C., Weaver, L.

34. CHARACTERISTICS OF REFUSE IN NATIONAL PARKS: Public Works, 87:7:95, July 1956.

A report of an investigation to study quantities and types of refuse produced in our National Parks. The median of the average quantity of refuse produced in lodges and hotels was 3.5 lbs. per capita per day and for garbage 2 lbs. per capita per day with a range of from 1.92 to 5.04 lbs. of garbage per capita per day. Also included are the results of physical analysis of garbage and rubbish in various type installations and areas within the parks.

Hopkins, William T.

35. SANTA BARBARA AWARDS 10-YEAR REFUSE SERVICE CONTRACT: The American City, 72:8:107, August 1957.

After conducting a public opinion survey, a special committee recommended refuse collection and disposal by a private contractor for Santa Barbara, California. Affirmative questionnaire results included a desire for pickup service, twice weekly collection, and banning of backyard burners. In a description of the ordinance and a contract, it is stated that all persons shall subscribe to regular collection, the contractor is controlled by the municipality, (including personnel) disposal is by sanitary landfill which is restricted by the city concerning the site and scavenging rights. A table on rate structure is included for residential special haul and commercial customers. Minimum residential rate is $1.75 per dwelling unit per month.

Mallison, G. F., Hohlock, W. F.

36. THE COMPOSITION OF RESIDENTIAL GARBAGE, Public Works, 87:6:112, June 1956.

A report of a study by Michigan State College in connection with composting research. Study includes one years' data, on a monthly basis of the components of wrapped East Lansing garbage. Included is average data to facilitate making up a representative synthetic garbage for laboratory purposes. It is estimated that wrapped residential garbage has an average moisture content of 60% whereas unwrapped garbage would have an average moisture content of 70%.

D. COLLECTION AND DISPOSAL - GENERAL (contd.)

Mann, David

37. THE CHANGE CAME GRADUALLY: The American City, 71:6:120, June 1956.

A summary of the development of modern refuse collection and disposal practices at Niagara Falls, New York, 1926-1956.

Martin, J. C., Hammerstrom, R. J., and Waldrop, R. H.

38. THE LAREDO STORY OF SANITATION PROGRESS: The American City, 72:2:116, February 1957.

The story of how Laredo, Texas initiated a well planned program, employed trained personnel, and used strong public support to overcome municipal vector control problems. This was a demonstration project which involved four principal steps. (1) organization and sanitary survey, (2) refuse collection and disposal, (3) improved sewerage services and (4) supplementary rodent control. The project was a cooperative demonstration with the Texas State Dept of Public Health and the U. S. Public Health Service.

Mulrain, A. W.

39. AN ACTION PROGRAM FOR A CLEANER CITY: Public Works Engineers' Yearbook, 1956, pp. 101-109, American Public Works Association, 1313 East 60th Street, Chicago 37, Illinois.

The story of the development and success of New York City's cleaner city program is discussed on its progressive development through ten basic phases. (1) Surveys to estimate the problem; (2) Planning to cope with the problems; (3) Development of inter-departmental cooperation; (4) Enlistment of citizen's committee; (5) Expansion of public relations and sanitary education program; (6) Adoption of enforcement program; (7) Evolution of alternate side of street parking to assist in cleaning streets; (8) Establishment of litter basket and anti-littering program; (9) Abatement of vacant lot nuisances; (10) Initiation of junk collection service.

D. COLLECTION AND DISPOSAL - GENERAL (contd.)

Mulrain, A. W.

40. NEW YORK PROVES ANTI-LITTER CAMPAIGN CAN BE EFFECTIVE: Public Works, 87:1:96, January 1956.

A description of the development of a program to improve street cleanliness in New York City.

Scott, W. J.

41. DISPOSAL OF MUNICIPAL REFUSE IN CONNECTICUT: Connecticut State Department of Health, 71:6:1-12, June 1957.

A comprehensive report including data on the state statutes governing refuse handling in Connecticut, storage, collection, and disposal practices and costs in cities in Connecticut, having over 10,000 population are discussed.

Smith, C. N., Keller, J. C.

42. FLY CONTROL FOR CITIES: Public Works, 87:6:122, June 1956.

The importance of municipal sanitation in a community fly control program is emphasized. The use of insecticide baits and contact and residual sprays as supplements to a sanitation program or as temporary expedients are described including methods, application, equipment, organization and types of baits and sprays.

Weaver, Leo

43. PROGRESS IN REFUSE DISPOSAL: Public Works Engineers Newsletter, 23:9:1, March 1957; also Public Works, 88:5:145, May 1957.

The question of "how we are doing and where we are going in the field of municipal refuse disposal" is scrutinized. A trend graph shows the cumulative totals of U.S. cities which have adopted the sanitary landfill and incineration methods. A qualitative evaluation table of the more than 1,000 sanitary landfills currently operating in the U.S. is included.

D. COLLECTION AND DISPOSAL - GENERAL (contd.)

Wilson, N. G.

44. PANORAMA ACROSS THE POND: Public Works Engineers' Yearbook, 1956, pp. 29-44, American Public Works Association, 1313 East 60th Street, Chicago 37, Illinois.

A paper delivered at the 1956 Public Works Congress at Fort Worth, Texas, by the President of the International Association of Public Cleansing. Included is a discussion of the development and value of the Institute of Public Cleansing (England) and its contact with the International Compost Working Party as well as a report on public cleansing in England. The latter reviews costs, regionalization, makeup of the cleansing service, management and labor relationships, street cleansing, snow clearance, refuse storage, collection and disposal practice, collection and equipment. A section of the paper is a detailed report on methods of seasonal quantitative analyses of dry household refuse.

(Collection and Disposal - General)

SEE ALSO NOS. 60, 63.

E. COLLECTION - Equipment

Anonymous:

45. ATLANTA LETS GEORGE DO IT: Public Works, 88:9:112-113, September 1957.

A description of the application of the portable container method to collection of industrial refuse in Atlanta, Georgia. Included are data on the use of large volume compactor trucks for transfer purposes.

Graydon, S. W.

46. WE ARE TRYING A KING-SIZED TRUCK: The American City, 71:2:125, February 1956.

Atlanta, Georgia reports on the use of large portable containers in conjunction with a specially designed 32 cu. yd. compactor type semi-trailer for reducing the cost of haul to the disposal area.

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E. COLLECTION - Equipment (contd.)

Morrison, J. L.

47. BETTER REFUSE COLLECTION WITH PACKER-TYPE TRUCKS: Public Works, 88:8:109, August 1957.

Burlington, North Carolina reports increased efficiency in refuse collection after changing from open-body trucks to packer-type trucks. Disposal is by sanitary landfill.

Muckelroy, E. F.

48. AN AUTOMATIC EFFICIENCY EXPERT: The American City, 71:1:156, January 1956.

An account of the increased efficiency achieved by the installation of automatic vehicle mileage recorders on refuse collection and street cleaning vehicles at El Paso, Texas. The data collected was used as one basis for rewarding efficiency.

Rogus, C. A.

49. WEIGHT REFUSE ELECTRONICALLY: The American City, 72:4:128, April 1957.

New York City has started to weigh refuse electronically as an efficient means of obtaining accurate operating and production data for the management of the sanitation department. Their operation is described in three phases: (1) the electronic weighing system, including the weighing operation, accuracy, merits of the system, economics. (2) Use of performance tickets for recording statistical data for use at the various administrative levels. (3) Personnel and equipment usage.

Screvane, Paul R.

50. EQUIPMENT REPLACEMENT: Public Works, 88:3:123, March 1957.

A comprehensive report on New York City's policy for timely equipment replacement in order to assure efficient and economic operation. The major factors influencing operational costs which must be compared between new and old units to determine such a policy are listed and discussed in detail. These include: 1) productive capacity of the units, 2) productivity of labor, 3) fuel consumption, 4) maintenance and repair costs and, 5) reliability of service.

E. COLLECTION - Equipment (contd.)

Smith, Carl

51. 31% MORE REFUSE WITH 40% FEWER TRUCKS: The American City, 72:6:131, June 1957.

Cedar Rapids, Iowa has changed over from the use of 17 canvas-covered trucks and now employs 10 compactor type trucks for the collection of residential refuse. More material is collected using fewer employees and at a decreased cost. The use of the task system reportedly keeps morale and efficiency high. Refuse is disposed of in a sanitary fill using the area-fill method.

(Collection - equipment)

SEE ALSO NOS. 7, 10, 11, 20, 26, 28, 31, 33, 44, 53, 56, 60.

F. COLLECTION - General

Anonymous:

52. MADISON HEIGHTS SANITARY GARBAGE COLLECTION SERVICE: Virginia Health Bulletin, 9:7:1-12, November 1956.

This entire issue is devoted to the story of the step by step development of a refuse collection and disposal system for a sanitary district of 10,000 population at Amherst County, Virginia. Included are references to county supervisor's meetings, public hearings, method of financing, and public education techniques. Collection and landfill operations are performed by a private contractor under the supervision of the county health department.

53. SANITATION PROGRESS AND PROBLEMS IN EL PASO: Public Works, 87:5:160, May 1956.

A brief description of problems incurred by El Paso's growth from a city having an area of 8,736 acres to one having an area of 43,360 acres. In 1945, 18 collection vehicles were used, there were 48 personnel and a budget of $170,000. In 1955, there were 108 personnel, 31 modern collection trucks, and a budget of $438,343.

E. COLLECTION - Equipment contd.

Anonymous:

54. VOLUME OF ROADSIDE RUBBISH AND DEBRIS: Public Works, 88:5:190, May 1957.

Brief item reporting collection of 852 tons of roadside rubbish from 130 miles of state trucklines in 1956 by Marquette Co., Michigan. 430 tons were removed from 1270 miles of county roads.

Fetrow, W. W.

55. WE CUT 30% FROM OUR REFUSE COLLECTION COSTS: The American City, 71:9:135, September 1956.

The net effect of re-routing, joint purchasing use of a sanitary landfill instead of an incinerator, and placing in service of new compactor type vehicles is outlined (Takoma Park, Maryland).

Fitzgerald, Clyde V.

56. WE LOWERED THE COST AND IMPROVED THE SERVICE: The American City, 72:8:126, August 1957.

Santa Monica, California reports on a study of its refuse collection program which resulted in the acquisition of compaction type collection trucks to replace open top, side loading trucks, and a revision of the route system and collection schedules. Auxiliary power units were installed in the new trucks to afford continuous operation of the packing mechanism while the vehicles were in motion. The collection system was revised from each crew having definite work route to a concentration of all equipment and personnel to a designated area each day. This is reported to be quite advantageous, increasing morale and efficiency. A "keep our fair city clean" program was also initiated making use of Parky, the kangaroo, Los Angeles' symbol of good housekeeping.

Goerlick, H. L.

57. ZONE-TYPE REFUSE CONTRACTS: The American City, 71:10:167, October 1956.

Lakewood, California reports the satisfactory arrangement for multiple contracts for trash collection under a carefully developed set of specifications and regulations. Included is an outline of ordinance and bond specifications.

E. COLLECTION - Equipment contd.

Orr, J. H.

58. PORTLAND ADOPTS MUNICIPAL REFUSE COLLECTION SERVICE: The American City, 71:8:106, August 1956.

A report of how Portland, Maine (1950 population 77,634) planned and initiated a bi-weekly rubbish collection program. Data for planning included assumption of 15,000 pickup points in the city and one truck can handle 360 pickups per day, and an adequate budget for 1956 would be $50,440. A brief description of public relations efforts is also given.

Wentz, J. B.

59. CLEANER ALLEYS: The American City, 11:3:152, March 1956.

A street sweeper is used to supplement a refuse collection system to insure cleaner alleys at Beverly Hills, California.

(Collection - General)

SEE ALSO NOS. 8, 18, 19, 20, 26, 28, 30, 33, 35, 38, 44, 45, 48, 60, 63, 99, 117, 120.

G. DISPOSAL - General

Anonymous:

60. EQUIPMENT AND MATERIALS FOR MUNICIPAL SANITATION -- REFUSE COLLECTION AND DISPOSAL: The Sewerage Manual, 1956. (Chapter 14). Published by Public Works Magazine, Ridgewood, New Jersey.

The chapter discusses the various methods of disposal including incineration, sanitary landfill, grinding, etc., with special emphasis on plant and equipment description and manufacturers. Also included is a section on refuse collection vehicles and equipment with a similar emphasis on available types of equipment, specifications, manufacturers, etc.

61. NEW YORK CITY SWATS LITTERBUGS - WITH FINES: Public Works Engineers' Newsletter, 21:12:1, June 1955.

A brief history of the development of New York City's Clean City Program.

G. DISPOSAL - General contd.

Anonymous:

62. SAWMILL MAKES TREE DISPOSAL PROFITABLE: The American City, 71:10:105, October 1956.

Kansas City, Missouri (Welfare Department) operates sawmill and reports transforming waste logs into lumber and branches into cordwood which are much in demand thereby eliminating brush burning nuisance and saving $20,000 annually.

Bolde, A. C.

63. REFUSE DISPOSAL: Sanitalk, 4:2:16, February-March-April 1956.

A summary of the essence of legislation in Massachusetts governing refuse collection and disposal; a review of the health aspects and recognized disposal methods; and a report of the results of a survey of collection and disposal practices in Massachusetts. Briefly, in 62 communities reporting, (1) the health department was responsible for supervising refuse collection and disposal in 66%; (2) only 8% of the cities collected garbage with municipal forces whereas 76% used city forces to collect rubbish; (3) The individual was responsible for the disposal of garbage in 27% of the cities and for rubbish in 13%; (4) Ninety-eight percent of the cities disposed of garbage by feeding it to hogs and 85% of the ities disposed of rubbish on open dumps.

Hough, H. T.

64. TRANSFERRED LOADS SOLVED THIS DISPOSAL PROBLEM: Municipal Engineering (England), May 31, 1957. Abstract: Public Works, Sewerage and Refuse Digest, pp. 201-202, September 1957.

A brief description of a 50 ton per day capacity refuse transfer station constructed by the County Borough of Liverpool. A side elevation sketch of the plant is included.

G. DISPOSAL - General contd.

Morton, R. J., Struxness, E. G.

65. GROUND DISPOSAL OF RADIOACTIVE WASTES: American Journal of Public Health, 46;2:157, February 1956.

A discussion of the problems of waste disposal inherent to the production and utilization of nuclear energy. Included are descriptions of sources and kinds of waste, liquid wastes, prospects of widespread development of nuclear power, problems of disposal of power reactor process wastes, and proposed methods of disposal. The concept of ground disposal is reviewed with respect to limitations and the results of use of waste pits for ground disposal at the Oak Ridge National Laboratory are outlined.

Rawn, A. M.

66. PLANNED REFUSE DISPOSAL FOR LOS ANGELES COUNTY: Civil Engineering, 26:4:41, April 1956.

A resume of a report considering the various methods of refuse disposal for use in Los Angeles County in the face of a growing air pollution problem and the spread of disease among hogs fed uncooked garbage. The disposal of mixed refuse in sanitary landfills was favored, and it was recommended that the districts own and operate the landfills and transfer and haul rubbish to them, while the collection of the mixed refuse would be left to the local authorities.

Walker, C. H.

67. DETROIT'S PLAN FOR A GARBAGE FREE CITY: Public Works Engineers' Newsletter, 22:8:1, February 1956. Also The United States Municipal News, 23:6:1, March 15, 1956.

A years' progress is measured in Detroit's program to encourage the installation of approved individual premises disposal units. Information on costs, sales, clinics cooperative efforts with industry and civic organizations are included. Detroits' ordinances No. 77-F on Refuse Burning Equipment Incinerators and No. 81-F on Garbage Disposals (food waste grinders) which were developed to set up specifications and standards, as well as to permit control of the type equipment to be installed are reproduced.

(Disposal - General)

SEE ALSO NOS. 8, 26, 28, 33, 38, 44, 60.

H. DISPOSAL - Composting and Reduction

Anonymous:

68. DIGESTER CONVERTS SAWDUST INTO HUMUS: Civil Engineering, 26:4:92, April 1956.

Brief report of one year's operation of a pilot project on sawdust digestion being carried out by the Organic Pacific Company of Oregon. Results are reported to justify construction of a commercial installation at a cost of about $30,000 (capacity of 50 tons per day) cost of operation without overhead is estimated at $3.50 per ton of humus.

69. MCKEESPORT PLANT TO TURN TRASH INTO FERTILIZER: The American City, 71:12:15, December 1956.

Item reporting the construction of a 140 ton per day composting plant at McKeesport, Pennsylvania by the Organic Corporation of America. Construction cost was $350,000. Two types of proposed lease -- operating and construction agreements for such plants with interested cities are briefly discussed.

70. THE MCKEESPORT EXPERIMENT WITH REFUSE COMPOSTING: The American City, 72:9:15, September 1957.

McKeesport, Pennsylvania has the nation's only plant which composts city refuse into a soil conditioner available for sale. Article reports the processing procedure, discusses the resultant ingredients of the process and poses questions to be answered before another city is to take up this disposal method.

H. DISPOSAL - Composting and Reduction contd.

American Society of Civil Engineers:

71. PILOT PLANT COMPOSTING OF MUNICIPAL GARBAGE AT SAN DIEGO, CALIFORNIA: Proceedings of the American Society of Civil Engineers, Journal of Sanitary Engineering No. SA1, 82:1:887-1, February 1956.

A pilot plant investigation of composting of municipal garbage at San Diego, California, the study was initiated to determine the feasibility of composting municipal garbage. Various methods of composting, including the use of additives and grinding, were tried. The economic data derived are summarized, critically discussed and evaluated. Complete stabilization of the garbage required 30 - 90 days of composting. Costs varying from $1.56 - $20.48 per ton of fresh garbage were incurred for composting. It was conservatively estimated that 25 acres would be needed to operate a 50 ton/day composting plant.

Anderson, M. S.

72. COMPOST AS A MEANS OF GARBAGE DISPOSAL: Proceedings, Florida Soil and Crop Society, (Paper presented at Clearwater, Florida meeting November 29, 1956).

Methods of garbage disposal in current use are briefly discussed along with the history of the use of composting in the U.S. Data on the chemical analysis of compost (NPK) from 13 sources in the U.S. are listed: the fertilizer value of garbage composts, the results of crop response studies, and market outlets potential is indicated.

Gotaas, H. B.

73. COMPOSTING: SANITARY DISPOSAL AND RECLAMATION OF ORGANIC WASTES: Monograph No. 31, World Health Organization, Geneva, 1956. Columbia University Press International Documents Service, New York 27, New York. Price $5.00. 265 pages.

The author discusses briefly the processes involved in the decomposition of organic matter and describes in detail composting methods recommended for large towns, villages, and individual farms. Diagrams and photographs are used to illustrate the methods. Included is a chapter on methane recovery from the digestion of manure and night soil and a comprehensive discussion of the public health phases of the disposal of wastes on land.

H. DISPOSAL - Composting and Reduction contd.

Grindrod, J.

74. MECHANICAL COMPOSTING OF GARBAGE AND SEWAGE SLUDGE: Public Works, 87:6:119, June 1956.

A description of the Dano-Bio-Stabalizer process. It is reported that the company's factory plant at Copenhagen can produce usable compost in 3 to 5 days. Reference is made to a 5 ton per day plant now operating at Zurich, Switzerland, and the new 20 ton per day plant at Edinburgh, Scotland is described in some detail. The latter is reported to produce finished compost in 5 to 6 days. Included is a seasonal breakdown of crude refuse at Edinburgh. 1953-1954.

Grinnell, R.

75. SLUDGE -- HELP YOURSELF: Wastes Engineering, March 1956.

A description of how Brimingham, Michigan makes a compost of sewage sludge, leaves, and wood chips. The compost is given away on a help yourself basis.

Henderson, John M.

76. REFUSE COMPOSTING IN INDIA: Public Works, 88:11:99, November 1957.

The Indore and Bangalore processes of refuse composting are described. Comment is made on the public health problems involved.

Kringe, P. R.

77. Discussion of A PRELIMINARY STUDY OF HIGH RATE COMPOSTing: (Proceedings Paper 846) American Society of Civil Engineers' Journal of the Sanitary Engineering Division, 82:SA4:1048-11, August 1956.

The author discusses this paper in view of his experience at the National Chemical Research Laboratory at Pretoria, South Africa and a recent visit to the U. S. Questions are raised on use of the term "refuse" and the technique used in determining moisture (the toluene distillation method is offered in lieu of the 105° C. oven drying method). Causes of the initial acidic phase of a composting run are discussed and the importance of physical factors (rate of stirring moisture, aeration) is reviewed.

H. DISPOSAL - Composting and Reduction contd.

Lugo-Lopez, M. A., Landrow, P., Jr.

78. PRACTICAL EVALUATION OF GARBAGE COMPOST AS A FERTILIZER UNDER CONDITIONS IN PUERTO RICO: Journal of Agriculture of the University of Puerto Rico, 40:2:110, April 1956.

Data are presented to show the relative economic inefficiency of garbage compost when compared with inorganic fertilizers and filter press cake (sugar cane waste). These conclusions were reached based on Puerto Rican soil conditions wherein it is reported the organic matter levels of the soils are not so low to justify the use of commercial composts.

McCauley, R. F.

79. RECENT DEVELOPMENTS IN THE COMPOSTING OF ORGANIC WASTES: Water and Sewage Works, 103:11:522, November 1956.

A report of studies on composting at Michigan State University. In discussing the immediate applicability of composting as a method of municipal refuse disposal the author states that although the method appears economically feasible additional equipment development work is needed as well as actual marketing experience. Know how already available and the present trend indicates this development will be reached in the near future.

Quartly, E. V.

80. PILOT-PLANT GARBAGE COMPOSTER: The American City, 71:10:109, October 1956.

A detailed report of investigations by the city of San Diego, California with the conclusion that the process is promising but still economically problematic. Included are data on moisture content of refuse and compost, chemical analysis (NPK) cost of production, and recommendations for further study.

Riker, R. W.

81. GARBAGE CAN PRODUCE REVENUE: Public Works, 87:8:107, August 1956.

The operation of an experimental composting plant at Williamston, Michigan (population 2, 500) is described. The plant is reported operating successfully by utilization of techniques and equipment developed by the Sanitary Disposal Corporation of Lansing, Michigan, over a four year experimental period.

Snell, John R.

82. COMPOSTING YOUR ORGANIC WASTES AT A PROFIT: Public Works, 88:11:108, November 1957.

The composting process is discussed emphasizing its economical benefits to industry and communities. Opinions concerning the pros and cons of different composting methods (both mechanical and non-mechanical) and marketing of the end product are also given.

83. SOME ENGINEERING ASPECTS OF HIGH-RATE COMPOSTING: Proceedings of the ASCE Journal of Sanitary Engineering No. SA1, 83:1178-1, February 1957.

The article is a comprehensive compilation of information on high-rate composting and gives the work being done and to be done in this field of refuse disposal. The technical information reported is highly detailed and is designed to stimulate other engineers and researchers to further test the data given and come up with more reliable conclusions.

H. DISPOSAL - Composting and Reduction contd.

Wiley, J. S.

84. Discussion of PILOT PLANT COMPOSTING OF MUNICIPAL GARBAGE AT SAN DIEGO, CALIFORNIA: Progress Report of the Sanitary Engineering Research Committee. (Proceedings Paper 887) American Society of Civil Engineers Journal of the Sanitary Engineering Division, 82:SA4:1048-17, August 1956.

The author reviews results of the San Diego experiments and points out the importance of particle sizing and benefits of the use of dry refuse such as paper in obtaining an optimum compost environment. The results of the analysis of the composted materials is discussed with relationship to discrepancies in results of volatile solids and dry solids analysis and a more favorable cost computing technique is preferred.

85. STUDIES OF HIGH-RATE COMPOSTING GARBAGE AND REFUSE: Proceedings, 10th Industrial Waste Conference, Purdue University, May 9-11, 1955, pp. 306-313, March 1956.

Some results of experiments carried on at the Technical Development Laboratories of the Public Health Service using six batch type laboratory size composting units are reported including: (1) temperature is a reliable measure of degree of decomposition. (2) stirring rates of 0.10 to 0.61 r.p.m. and possibly higher for composting in experimental units should be satisfactory. (3) optimum aeration values in the laboratory units is in the range of 10-30 cu. ft./day/pound of volatile solids. (4) optimum moisture range for composting garbage and other refuse with a high paper content in batch units appears to be 55to 69 per cent.

(Disposal - Composting and Reduction)

SEE ALSO NOS. 18, 19, 33, 44, 96, 120, 127.

I. DISPOSAL - Garbage Grinding

Anonymous:

86. GROUND GARBAGE BRINGS CLEANER SEWERS: The American City, 71:6:29, June 1956.

Brief report that roughage in food wastes ground and disposed into the sewerage system at Jasper, Indiana has tended to "scrub out" the sewers. Data on air requirements and sludge and gas production at the activated sludge plant are included.

87. HERE IS HOW JASPER DID IT -- FROM HOG FEEDING TO HOME DISPOSAL! SIX YEARS BEFORE DETROIT...: Wastes Engineering, 27:4:171, April 1956.

Excerpts from two papers by F. D. Wraight, Indiana State Board of Health outlining background reasons for Jasper, Indiana's encouragement of the city-wide installation of food waste disposers. Certain conclusions resulting from the study, as well as the general pros and cons of grinding are also outlined.

88. LAST LEAFLET MARKS END OF CITY GARBAGE GRINDER PUSH: Engineering News-Record, 157:9:28, August 30, 1956.

Brief report that the city of Detroit has curtailed its educational campaign to promote the installation of household food waste grinders.

89. WILL HOME FOOD-WASTE GRINDERS INJURE SEWERS AND SEWAGE PLANTS: Wastes Engineering, 28:1:29, January 1957.

A report on a survey by Albuquerque, New Mexico, of 15 cities indicated with regard to the impact of garbage grinders on the sewerage system, (1) no noticeable increase in sewer maintenance costs, (2) moderate increase of sewer stoppages, (3) treatment costs are moderately increased, (4) volume of garbage introduced into the system does not materially affect the total quantity, (5) increased B. O. D. and setteable solids at sewage plant justify increase in sewer charges where such charges are based on a fixture count.

I. DISPOSAL - Garbage Grinding contd.

American Society of Civil Engineers:

90. ADVANCES IN SEWERAGE IN THE PERIOD FROM OCTOBER 1, 1954 TO DECEMBER 1, 1955: Journal of the Sanitary Engineering Division No. SA3, June 1956, Paper 1013.

This is a progress report of the committee on sewerage and sewage treatment. It includes data on the effect of adding ground food wastes to sewage from Los Angeles, Minneapolis, St. Paul, and Denver. In general, it was found that difficulty might be experienced only where a home having a grinder is located at the very end of the sewer.

Baumann, E. R., Darrell, A. D., and Skodje, M. T.

91. PARTICLE SIZE DISTRIBUTION OF GROUND GARBAGE: Sewage and Industrial Wastes, November 1955.

The need for a code to provide for the establishment of a uniform particle size distribution and a reproducible procedure for determining particle size of ground garbage discharged to sewers are described. A code is proposed using a standard procedure for determining particle size, a synthetic garbage of fixed composition and a range of percent passing of 8 sizes of sieves from 1/2 inch to No. 60. Maximum size is limited to 1/2 inch and minimum size is set to limit the amount that will pass through the sedimentation tanks to the secondary treatment processes.

Drury, W. R.

92. DUAL SLUDGE -- GARBAGE DIGESTION WILL PROVIDE MORE ENGINE FUEL: Wastes Engineering, 27:4:158, April 1956.

A general description of Port Huron, Michigan's $1,300,000 sewage treatment works. Facilities for grinding garbage at the plant are also described. Although the sewage plant has been in operation two years, it has not been utilized for garbage disposal as yet.

I. DISPOSAL - Garbage Grinding contd.

Scharman, K.

93. EFFECTS OF GARBAGE GRINDERS ON SEWERS AT TUCSON, ARIZONA: Sewage and Industrial Wastes, 29:4:480, April 1957.

The author describes a series of tests run during 1956 to determine the effect of residential garbage grinders on sewers. Data on line cleanings, physical characteristics and test conditions are reported. After 9 months of testing it was concluded that design standards of a minimum velocity of 2 f. p. s, for all lines and 100 g. p. d. per capita for volume of flow should be satisfactory in determining minimum pipe size.

Wraight, F. D.

94. GARBAGE GRINDER EXPERIENCE, JASPER, INDIANA: Sewage and Industrial Wastes, 28:1:44, January 1956.

Since March 1950, 1,000 food waste grinders have been installed in Jasper, Indiana, a city of 6,200 population. The effect of this additional load on the activated sludge type sewage treatment plant, which is operating at 1/2 the design load is outlined including air requirements, suspended solids, BOD, sludge and gas production. It is reported that sludge deposits in the partly combined and partly separate sewerage systems is not a problem.

(Disposal - Garbage Grinding)

SEE ALSO NOS. 18, 33, 60.

J. DISPOSAL - Hog Feeding

Anonymous:

95. SUGGESTED ORDINANCE PROVIDING FOR THE ADOPTION OF THE MAINTENANCE OF SWINE CODE OF NEW JERSEY (1957): Public Health News, 38:9:282-285, September 1957.

A suggested ordinance and code is presented for consideration for adoption by any board of health to control garbage feeding establishments in New Jersey. New Jersey was the 47th State to adopt legislation requiring the cooking of garbage fed to swine.

J. DISPOSAL - Hog Feeding contd.

Black, R. J.

96. TRENDS IN REFUSE DISPOSAL AFFECTING THE SWINE INDUSTRY: California Vector News, 4:1:1, January 1957.

The author discusses the underlying cause for the decrease in per capita production of garbage in recent years. It is concluded that residential garbage production will continue to decrease; solid wastes from food packaging and processing plants will increase; and garbage feeding costs will increase. Also briefly reviewed are the sanitary landfill, incineration and composting methods and the open dump as a means of refuse disposal.

Carter, W. C.

97. TRICHINOSIS -- AN EPIDEMIOLOGICAL REPORT: Public Health News, 38:6:205, June 1957.

A report of the epidemiological investigations of eleven cases of trichinosis in the Central Health District of New Jersey. The author reports that a total of 45 cases were investigated in 1956 and emphasizes the importance of feeding cooked garbage to swine and also the need for sanitation in the care of the pigs as control measures.

Zimmermann, W. J., Schwarte, L. H., Biester, H. E.

98. INCIDENCE OF TRICHINOSIS IN SWINE, PORK PRODUCTS, AND WILDLIFE IN IOWA: American Journal of Public Health, 46:3:313, March 1956.

The results of a study of the incidence of trichinae in pork sausage (1944-1946) which showed an infection rate of 12.4 percent in bulk sausage and 11.7 percent in non-processed link sausage is compared with the results of a similar study in 1953-1955. In the latter study an evidence of 1.2 percent and 3.4 percent was found thus demonstrating a marked reduction coincident to the adoption of regulations requiring the disinfection of garbage fed to swine in "47 of the 48 States." A second phase of the study exploring the incidence of trichinae infection in various wildlife showed an incidence of 14.1% of wild mink and 30% of adult foxes examined were positive for trichinae.

(Disposal - Hog Feeding)

SEE ALSO NOS. 18, 19, 33, 63, 147.

K. DISPOSAL - Salvage

Anonymous:

99. COMBUSTIBLE RUBBISH STUDY IN LOS ANGELES: Public Works, 87:5:158, May 1956.

Data from a progress report of the Los Angeles Board of Public Works on a combustible rubbish pilot project being conducted in the harbor area. Three months operation (through February) indicated a $12.82 cost/ton for collection once weekly and disposal by incineration. (Included are direct and indirect costs).

100. HALF OF BURNED RUBBISH GOES UP IN AIR AS SMOG: Engineering News-Record, 157:3:44, July 19, 1956.

Brief item quoting statement of Research Director Los Angeles County Air Pollution Control District that rubbish burning may be a more serious contributor to smog than was heretofore believed. Studies indicate half of material placed in single chamber incinerator goes into the atmosphere -- about 75% CO, 23% in the form of various other organic compounds and 2% as solid particles. The amount expelled daily to Los Angeles atmosphere is said to "approximate ... or exceed .. (that) from motor vehicle exhausts."

101. 433% LARGER: The American City, 71:2:106, February 1956.

Babylon, New York rebuilds its ten-year old 90 ton incinerator to 390 ton capacity. Included are design data on pit volume, furnace appurtenance, grate area, crane installation, and development of an individual water supply. Capital cost was $2,564 per ton of rated capacity.

K. DISPOSAL - Salvage contd.

Anonymous:

102. IIA SPONSORS INCINERATOR RESEARCH: Public Works Engineers' Newsletter, 23:9:12, March 1957.

An investigation of incinerator design and related factors sponsored by the Incinerator Institute of America is initiated at New York University. The initial phase of the study consists of gathering data from manufacturers and users of incinerators, surveying past research, and conducting field inspections of incinerator installations.

103. INCINERATOR VACUUM CLEANER CUTS LABOR COSTS: The American City, 71:3:136, March 1956.

A stationary vacuum cleaning system at the Royal Oak, Michigan municipal incinerator permits rapid and convenient cleaning of combustion chambers and the chimney base.

104. MANEUVERABLE SAFETY BELTS: The American City, 71:2:16, February 1956.

A description of the design and utility of a safety belt for use of personnel engaged in charging the floor dump type incinerator at Oak Park, Illinois.

105. MONORAIL ELECTRIC HOIST HANDLES REFUSE ECONOMICALLY:

A brief report of the successful operation of a push button monorail electric hoist system of refuse incinerator charging at Gloucester, New Jersey. The unit which was installed in 1951 handles 23 tons of refuse per day. Initial cost of the system was about $4,500 for the hoist and scoop and $14,000 for the installation of the monorail and supports.

106. NEW INCINERATOR PROMISES LESS SMOG: Engineering News-Record, 157:15:47, October 11, 1956.

Report that Glendale, California has doubled its municipal incinerator capacity with the installation of a 90-ton furnace. LACAPCO tests demonstrated that the plant's discharge was well within the limits set forth by the county. Included is a description of the furnace unit with pictures and diagrams.

Anonymous:

107. N. Y. U. RECEIVES GRANT FOR RESEARCH ON GARBAGE BURNING: The Street Cleaner, 41:4:4, May-June 1957.

Brief account of announcement that the U. S. Public Health Service has granted $75,000 to New York University for a three-year study of apartment house incinerators.

108. OBSERVATIONS ABOUT MUNICIPAL INCINERATORS: The American City, 72:11:31, November 1957.

Conclusions of a panel discussion by the Sanitary Engineering Section of the American Society of Civil Engineers are summarized. Items covered include incinerator location, size of site, storage pit design, furnace design, fly ash control, incinerator residue and costs.

109. SPRAY SYSTEM SUPPRESSES INCINERATOR ODORS: The American City, 71:1:13, January 1956.

An account of the installation in the storage pit of the Brookline, Massachusetts municipal incinerator of a chemical spray system to control odors and allay dust.

Bradley, H. D.

110. TORONTO'S NEWEST INCINERATOR: The American City, 72:2:107, February 1957.

Report on the completion of a new 900 ton rated capacity refuse incinerator in Toronto, Canada. Total cost of the plant was $2,200,000. Note was made of an increase in the amount of garbage and combustible rubbish to be incinerated from 1.4#/capita/day in 1917 to 1.65#/capita/day in 1956.

Brown, W. D., Foyle, L. E.

111. INCINERATOR STYLES ARE CHANGING: The American City, 72:7:103, July 1957.

A comparison of 28 municipal incinerators shows a great variety in style. Article gives broad comparison of these plants including available furnace design data, size of plants, combustion chambers, expansion chambers, fly-ash arrestors, ash handling, building construction and waste heat recovery. Included are tables summarizing the design data.

K. DISPOSAL - Salvage contd.

Cates, Henry J.

112. OPERATION OF LOUISVILLE'S NEW INCINERATOR: Public Works, 88:12:110, December 1957.

A detailed account is given of the incineration process at Louisville's new plant. A schematic flow diagram is included to simplify the description of the passage of materials through the incinerator.

Evers, H. J.

113. TWO PLANTS FOR THE PRICE OF ONE: The American City, 71:7:101, July 1956.

Merrill, Wisconsin constructs a 35 ton per day incinerator in conjunction with its sewage treatment works. The furnace is designed to incinerate dewatered sludge cake having 65% to 70% moisture along with the refuse.

Gerhardt, P.

114. CHICAGO COMPLETES FIRST OF FOUR INCINERATORS: The American City, 72:1:96, January 1957.

The Medill incinerator, the first of four incinerators planned for Chicago is described. The 720 ton per day plant was built at a cost of $2,507,000. Refuse handled during the plants acceptance average 400 lbs. per cubic yard and contained only 3% by volume of garbage. Design specifications include storage pit 195 X 22' X 24' or 4250 cubic yards, 65 pounds per square feet per hour burning rate for the grates, 70 cubic feet of volume per ton per day for combustion and subsidence chamber and 250 ft. in height and 12' diameter stacks. Heat value of the refuse averaged 4,000 BTU per pound at 15% moisture. Fly ash removal is accomplished by water sprays. However, dust loadings were reportedly higher than 0.35 grains per cubic foot of gas measured at 60° F. adjusted to 12% CO_2.

K. DISPOSAL - Salvage contd.

Greeley, S. A.

115. BACKGROUND OF DESIGN CRITERIA FOR MUNICIPAL INCINERATORS -- THE DESIGNER'S VIEW: The American Society of Mechanical Engineers' Paper No. 56-SA46, delivered at ASME Semi-Annual meeting, Cleveland, Ohio, June 17-21, 1956.

The author reviews the background and scope of design criteria, lists cost breakdowns according to major incinerator components and includes data on types of furnaces, fundamental considerations, principal parts of a design, general aspects and arrangements, specific design criteria for the furnace and a discussion of air pollution control as it affects municipal incinerator design.

Hall, P. B.

116. ALEXANDRIA'S INCINERATOR RETAINS THE COLONIAL TOUCH: The American City, 71:11:109, November 1956.

A generally descriptive report of the construction of a 200 ton per 24 hour refuse incinerator at Alexandria, Virginia. The bin and crane type plant was placed in operation in 1956, and was constructed at a cost of $3,730 per ton of rated capacity.

Hettenbach, Charles F.

117. AN EXTRA-FEATURE INCINERATOR: The American City, 72:7:119, July 1957.

Abington, Pennsylvania reports on operation of its new 200 ton per day incinerator. The highly mechanical plant features a fire jet system for extinguishing storage pit fires. Data on Abington's incentive type collection system are also included.

K. DISPOSAL - Salvage contd.

Hirsch, Phil

118. INCINERATOR WILL SOLVE MANY REFUSE PROBLEMS: Public Works, 88:4:119, April 1957.

Evanston, Illinois is constructing a 180 ton per day incinerator for a population of 75,000 people at a cost of approximately $745,000. Design features include holding stack discharges to a minimum solids content, reduced refuse handling costs and elimination of ash disposal problems. Article reports how the new incinerator will be operated and includes diagrams. Also mentioned are the shortcomings of the existing disposal method of an inadequate incinerator with the surplus refuse going to an open dump.

Leake, John W.

119. LOUISVILLE INCINERATOR OPERATES ON PRODUCTION LINE BASIS: The American City, 72:11:104, November 1957.

Louisville, Kentucky's new incinerator, rated at 750 tons per 24 hours, is similar to that used in Atlanta, Georgia. It employs metal salvage and sludge drying which are reported to be money savers. The total cost of the highly mechanical incinerator was $3,700,000. A crew of 53 operates on a 24-hour day, 7 day week basis. Equipment types and sizes are standardized to simplify maintenance. Elaboration is made on fly-ash control, wood hogs, income and savings and the collection system for this site.

Lewis, J. V., Nussbaumer, N. L.

120. TWO NEW INCINERATORS: The American City, 71:9:105, September 1956.

A revamping program to improve refuse collection and disposal methods at Rochester, New York is described. Collection routes were reworked, modern equipment obtained, and a switch from "reduction" as a primary method of disposal to incineration is reported. The construction of two new incinerator plants and modernization of a third is described. The new plants (construction has been completed) were of 450 and 600 ton/24 hr. capacity respectively. Cost per ton of capacity for construction was $3,240. Operating costs are reported at $2.39 and $2.84 per ton for the plants. Equipment and tests to meet local air pollution requirements are also described.

McDevitt, F. J.

121. MUNICIPAL REFUSE, ECONOMICS IN ITS COLLECTION AND DISPOSAL: Public Works, 87:1:103, January 1956.

The engineering justification for the construction of several 100 ton municipal incinerator units equipped to utilize waste heat for generating power at St. Louis, Mo. is favorably reviewed.

122. ST. LOUIS TURNS TO INCINERATION: The American City, 71:7:124, July 1956.

The author traces the background development of the need for an incinerator program in St. Louis. Included are design details of the new Southside incinerator. It is reported that the original 100 ton design capacity which was based on 50 pounds of refuse burned per square foot of grate area with a furnace volume of 14 cubic feet per ton have been exceeded by as much as 70%. The single expansion chamber which serves four furnaces is designed to reduce gas velocities to 7 1/2 feet per second.

Meissner, H. G.

123. A SIMPLIFIED METHOD OF INCINERATOR DESIGN: The American City, 72:9:135, September 1957.

Report states that rule-of-thumb uncertainties can be eliminated from municipal incinerator design when calculations are based on heat transfer which permits direct application of engineering principles. A number of tables and graphs are included to quickly determine design factors. The use of a large furnace without a secondary chamber is advocated.

Michaels, A.

124. DESIGN CRITERIA FOR MUNICIPAL INCINERATORS: The American Society of Mechanical Engineers Paper No. 56-SA60, delivered at ASME semi-annual meeting, Cleveland, Ohio, June 17-21, 1956.

Factors governing incinerator-design criteria are discussed from the viewpoint of what a local official expects. Included are descriptions of current installations. Residue removal systems, construction and operating costs and the consulting engineers' and industry's function. A table of data on design, appurtenances and costs from 25 municipalities is included.

Schneider, Carl

125. INCINERATORS ARE CHEAPER: The American City, 72:11:172, November 1957.

The new New Orleans incinerator will cost $750,000 and is rated at 400 tons per 24 hours. Economical features, including hollow tile building walls and a ground floor without walls, are described. The total volume of the incinerator which is to be in operation by the end of the year, is 9,444 cu. ft. or 23.4 cubic feet per ton of rated capacity.

126. INCINERATORS WIN IN NEW ORLEANS: The American City, 71:5:129, May 1956.

A short report on the economic comparison of the use of landfills and/or incinerators in New Orleans. A table of comparative costs is included.

Scudder, G. H.

127. THE TOWN OF HUNTINGTON LOOKS AHEAD -- WITH INCINERATION: The American City, 71:4:106, April 1956.

Huntington, New York builds an incinerator after the apparent cost and rigid specifications set up by the city discouraged the adoption of composting as the method of disposal. Included are details of the incinerator design criteria used in the construction of a 150 ton plant at a cost of $2,700 per ton of rated capacity (building and equipment). Furnace grates were designed on the basis of 56 lbs. of refuse burned per square foot of grate area, combustion chamber and furnace volume were 13.4 cubic feet and 15.8 cubic feet per ton respectively and the size of the storage pit was 32 x 19 and 34 feet deep.

Sleeger, Warren H.

128. THREE FLORIDA INCINERATORS: The American City, 72:6:138, June 1957.

A comparison of incinerators at Miami, Ft. Lauderdale, and Coral Gables is presented with an engineering explanation of why they differ. Miami and Coral Gables because of their central location, take special precaution to insure clean stack gases. In addition, Miami produces power from its incinerator operation. Fort Lauderdale has a unusual minimum design taking advantage of its fairly remote location.

Ulrich, H. H.

129. AN INCINERATOR IS A GOOD INVESTMENT: The American City, 71:1:88, January 1956.

The background of the financing and construction of a 375 ton rated capacity incinerator at Omaha, Nebraska, by a non-profit private corporation is presented. Included are design, cost, and operating details.

Waldschmidt, M.

130. INCINERATOR SOLVES BURNABLE WASTE PROBLEM: Public Works, 88:2:96, January 1957.

South Euclid, Ohio reports on the construction and operation of a 100 ton floor dump type combustible refuse incinerator. Density of combustible refuse was found to be 250 #/cu. yd., direct operating cost is $1.81/ton, original cost of plant was $200,000.

Westergaard, V.

131. TRAVELING GRATES FIND A NEW FIELD OF USEFULNESS: Combustion, June 1955.

The background of the current incinerator building program in New York City is outlined. The development of traveling grates to facilitate feeding and burning of the refuse as well as handling of the ash through and from the furnace is described in detail. Data included are estimated input of refuse for design purposes (3.2 #/day) and operating experience relative to the use of the traveling grate system at the Betts Avenue, Ganswoort and South Shore Plants.

K. DISPOSAL - Salvage contd.

Xanten, W. A.

132. NUISANCE - FREE OPERATION FOR NEW INCINERATOR IN WASHINGTON, D. C.: Civil Engineering, 26:4:50, April 1956.

The design of the District's new 500 ton rubbish incinerator is outlined. Schematic diagrams, pictures and a table of design and equipment details are included. Basic design is said to be similar to other pit and crane type plants, except that unusually large flues were constructed (209 cu. ft. per ton) for better fly ash control. Also included is a resume of the disposal problems and characteristics of refuse produced. (1,100 lbs. of trash per capita is now produced. This is more than double that of 1945). Density of rubbish varies for the average from 200 to 230 lb. per cubic yard.

(Disposal - Incineration)

SEE ALSO NOS. 1, 5, 7, 10, 14, 18, 19, 20, 30, 33, 35, 43, 44, 55, 60, 96, 135.

L. DISPOSAL - Open Dumps

Anonymous:

133. OPEN DUMP BURNING ABANDONED IN BAY AREA: California Vector Views, 4:6:34, June 1957.

A brief report on the potential impact of the first regulation passed by the San Francisco Bay Area Air Pollution District prohibiting open dump burning after October 1, 1957.

(Disposal - Open Dumps)

SEE ALSO NOS. 3, 4, 14, 33, 63, 96, 118, 147, 153.

M. DISPOSAL - Salvage

Cayton, S.

134. REVENUE FROM REFUSE: Royal Society for the Promotion of Health Journal, 77:4:188, April 1957.

Current salvage practice in England is reviewed on an individual component of refuse basis. Included is a discussion of the utilization of waste paper, waste tins, baled and unbaled (including a brief account of the de-tinning process employed by the New London Electron Works at New Haven) textiles and general procedures of salvage recovery.

Thelin, C. M.

135. TIN-CAN SALVAGE IS GOOD BUSINESS: The American City, 71:9:20, September 1956.

A brief description of arrangements at Ft. Worth, Texas to salvage incinerator ash which is comprised 75% by volume of tin cans. Cans are rolled and sold under contract for use in copper mining.

(Disposal - Salvage)

SEE ALSO NOS. 18, 19, 20, 22, 33, 44, 62, 119.

N. DISPOSAL - Sanitary Landfill

Anonymous:

136. A BIG MACHINE FOR A LITTLE TOWN: The American City, 71:3:195, March 1956.

A grader equipped with a loader is used on a part-time basis on a rubbish fill at Hillsboro, Wisconsin (population 1, 500).

137. AN OOLITE -- COVERED SANITARY FILL: The American City, 71:2:119, February 1956.

Key West, Florida operates a sanitary fill and obtains cover material by dredging "Miami Oolite" or "marl" from the ocean bottom. The oolite is a soft rock easily pulverized that can be worked like clay but becomes hard and dense when compacted.

N. DISPOSAL - Sanitary Landfill contd.

Anonymous:

138. CEDAR RAPIDS, IOWA EXPORTS GOOD SANITATION: The American City, 71:1:110, January 1956.

A brief description of the development of the use of the sanitary landfill at Cedar Rapids, Iowa. The landfill was used as a demonstration site to show tractor companies' sales engineers from 34 overseas countries how a city could benefit from a good sanitary landfill program.

139. FROM GARBAGE TO GOLF COURSE: The American City, 71:4:125, April 1956.

A brief report of how Houston, Texas reclaims 14 acres per year with the sanitary landfill.

140. LOAD-BEARING CHARACTERISTICS OF REFUSE TIPS: The Surveyor (England), January 7, 1956.

A report of results of tests to determine the usability of a domestic refuse tip covered with ashes to support medium weight aircraft deflections from a vehicle equipped with 12 x 20" tires inflated to 70 lbs./sq. inch with a load of 12,000 lbs. per tire were recorded to range as follows: An access road over 10 feet of refuse (two layers 4'-6" deep with 6" of clinker cover) which had been used by refuse trucks for 14 months, no deflection. On a portion of the fill 42 days old (4'-6" deep and covered with 4" of ashes) a permanent deflection of 1 to 2 inches was recorded.

141. PAPER-CATCHER FENCES: The American City, 71:8:118, August 1956.

Brief report of use of three fences 100 yards apart to catch blowing paper at sanitary landfill disposal area in Cheyenne, Wyoming. It is reported that "much of the trouble" from blowing paper resulted from scavenging operations.

N. DISPOSAL - Sanitary Landfill contd.

Anonymous:

142. SANITARY LANDFILL COSTS 68¢ PER TON FOR DISPOSAL: Public Works, 88:4:177, April 1957.

Tucson, Arizona has kept complete records on cost and efficiency since changing to sanitary landfill five years ago. The average cost for its landfill is 68¢ per ton. Records have been valuable in getting greatest efficiency from personnel and machinery. Tucson's landfill operations for its 100,000 population is described.

143. SANITARY LANDFILL IN SWAMPS: American Municipal News, 10:6:3, June 1956.

Syracuse, New York reports successful use of sanitary landfill method in swampy land employing a dragline to excavate swamp bottom material for daily cover.

144. SANITARY LANDFILL RECLAMATION: The American City, 71:12:15, December 1956.

The successful use for ten years of the sanitary landfill method of refuse disposal at Austin, Texas is described.

Black, R. J.

145. SANITARY LANDFILLS SERVING CALIFORNIA COMMUNITIES: California Vector Views, 4:2:8, February 1957.

A report of operating data on 29 sanitary landfills serving California communities. Included is data on estimated population served, type of refuse, types of operation, type, number, and size of equipment, type, frequency, and thickness of earth cover, depth of each layer and total depth of fill, type of terrain, whether burning is practiced, fire fighting system and cost.

Black, R. J. and Barnes, A. M.

146. EFFECT OF EARTH COVER ON HOUSEFLY EMERGENCE: Public Works, 87:3:109, March 1956.

Studies by the University of California and the California State Department of Public Health showed that uncompacted Hanford light sandy loam soil to a depth of 60 inches was not sufficient to prevent the emergence of house-flies. When compacted at 8.5% moisture content the soil cover prevented fly emergence at a depth of only 1-1/8 inches. In regard to sanitary landfills, laboratory tests indicated that compacted cover of as little as 3 to 6 inches should prevent the emergence of houseflies under field conditions.

Bowman, K. L.

147. WE BURIED OUR COMPLAINTS WITH REFUSE: The American City, 71:6:150, June 1956.

The development of a modern refuse collection and disposal system at Shelbyville, Indiana is described. Hit and miss collection with an open dump and insanitary methods of feeding garbage to hogs are replaced by a planned collection system and the sanitary landfill method of disposal. Included is a description of regulations promulgated, a public relations program, use of the incentive system and a breakdown of costs from 1951 - 1954 inclusive.

Chanin, G.

148. DECOMPOSITION EFFICIENCY OF SANITARY LANDFILLS: Public Works, 87:2:103, February 1956.

A study of decomposition efficiency after disposal by sanitary landfill of bar screenings and grit from the sewage treatment plant of East Bay Municipal Utility District (San Francisco Bay Area). A mathematical method of determining efficiency of decomposition is presented. It was concluded that "organic materials disposed of by burial at this sewage treatment plant are generally almost 98 percent decomposed in one year and virtually completely destroyed (99%) in two years ... if cannery wastes are included in the buried material ... 50 percent decomposition is obtained in one year and about 96 percent in two years."

Dunn, Walter L.

149. SEATTLE'S REFUSE DISPOSAL REFORMATION: The American City, 72:3:110, March 1957.

Seattle has converted a swampland site into a sanitary landfill for garbage. The site is adjacent to the University of Washington which will use the 70 acres for parking, play fields, drill fields, and a golf course. Previously, garbage dumped at the site was only covered once a week with inadequate cover allowing leaching and cracking that released odors and caused other nuisance factors.

150. SETTLEMENT AND TEMPERATURE OF A COVERED REFUSE DUMP: The Trend in Engineering, 9:1:19, January 1957, University of Washington Engineering Experiment Station, Seattle, Washington.

Studies of the physical and biological actions within Seattle's union bay refuse disposal sites are reported. Reduction in volumes of refuse as delivered to the site by compaction is almost 70 percent. Ratio of loose earth used as cover material to compacted fill was about 1 to 3 - 40% settlement of the 20 - foot fill was recorded in one year (area of operations was swampland) temperatures developed within the fill did not exceed 101° F. and gas production was found to be considerable. Odors were found to be a problem where cracks developed and burning of methane gas produced within the fill by using well point type waste gas burners is described.

Fagerlind, Carl C.

151. SANITARY LANDFILL EXTRA BENEFITS: The American City, 72:5:122, May 1957.

Waterloo, Iowa has combined sanitary landfill operations with flood protection work, island removal and land reclamation to protect the city, raise property values, and create new industrial sites. The procedure and equipment used is described.

Fahy, V.

152. SANITARY LANDFILL IN MINOT: Official Bulletin, North Dakota Water and Sewage Works Conference, 25:3:17, September 1957.

July 1957, marked the end of one years' successful operation of a ravine type sanitary landfill at Minot, North Dakota. Included in the report is a brief description of the background development and summer and winter operational techniques used.

Greene, Harley R.

153. SANITARY LANDFILL BY CONTRACT: The American City, 72:3:134, March 1957.

Bloomington, Illinois has converted a large open dump to a sanitary landfill because several injunctions were received due to the rats, smoke, fire, and odor at the dump. For lack of large earthmoving equipment, a contractor was hired to cleanup the dump and to operate the sanitary landfill at a cost of $17,500 for the first year of operation. The rat population was depleted by using poison mixed with chopped fish and bread and 4 kills over a 60-day period did the job. The solution to the filling of a gravel pit is included.

Hanna, M.

154. MUNICIPAL GOLF COURSE BUILT ON WASTE LAND: Public Works, 87:5:155, May 1956.

The sanitary landfill is used to reclaim tidal flats on Bay Farm Island, Alameda, California.

Kennaugh, John H.

155. RUBBER-TIRED TRACTOR SUCCESSFULLY HANDLES SANITARY LANDFILL OPERATIONS: The American City, 72:9:110, September 1957.

Buchanan, Michigan reports that after six months of experience with a rubber-tired tractor, it has shown increased speed and mobility and usefulness on other jobs as compared with the track-type tractor previously used. Time at the landfill site has averaged 1/5 of that required by track-type equipment. Refuse is covered with sand before compaction to reduce tire wear. Operational costs for collection for over 1,650 pick-up points averages about $1,545 per month. Disposal has averaged about $220 per month. For fiscal year 56-57, refuse collection and disposal cost each customer $1.17 per month excluding insurance and depreciation.

Koetter, E. P.

156. HOW TO PLAN A SUCCESSFUL LANDFILL PROGRAM, Public Works, 87:11:78, November 1956.

(See other article by Koetter in American City). In addition a hypothetical cost analysis of a sanitary landfill is listed for a city of 35,000 population. A cost per ton of .58¢ is estimated.

157. KEEP THAT SANITARY LANDFILL SANITARY: The American City, 71:11:130, November 1956.

The author discusses the problem of the deterioration of sanitary landfill operating methods in many cities. Fundamentals to the performance of an adequate job are reviewed including competent and interested supervision, an informed public, and adequate equipment. The importance of cost accounting methods is emphasized and a representative cost per ton is reported to be $0.54.

Paige, Clayton W.

158. BURBANK, CALIFORNIA, FILLS CANYON TO GAIN NEEDED LAND: The American City, 72:5:144, May 1957.

A canyon located less than 2 miles from the center of Burbank, California, affords a large concealed site for sanitary landfill operations. The land adjacent to a park and open air theatre is being reclaimed for use as a vitally needed parking area.

Rice, C. M.

159. PEAK REFUSE LOADS ARE NO PROBLEM: The American City, 71:10:24, October 1956.

Bellaire, Texas reports the adoption of a flexible sanitary landfill program to cope with the refuse from a fast growing population (18,000 to 24,000 in two years).

Scates, C. H.

160. SANITARY FILL ENDS 50 YEARS OF PUBLIC NUISANCE: Public Works, 88:10:135, October 1957.

A brief report on the use of the sanitary landfill method of refuse disposal at Union City, Tennessee to reclaim land for park development.

Skornicka, Joseph E., Jr.

161. SANITARY FILL BY THE RAMP METHOD: Public Works, 88:5:137, May 1957.

Article reports on the operating sequence of the ramp method of refuse disposal by sanitary landfill. Illustrated and discussed are the versatility of the ramp method for filling pits, holes or sides of hills, or filling flat land or long ravines. Advantages of the sanitary landfill method including low initial investment, all refuse is disposed together, flexibility, and reclamation of land are briefly reviewed.

Smith, Carl D.

162. MUNICIPAL REFUSE -- A LOW COST RESOURCE, Public Works, 88:7:94, July 1957.

Cedar Rapids, Iowa reports use of the sanitary landfill method of refuse disposal to fill marginal land for use as a park. The 1955 cost of running the landfill operation, excluding capital investment, but including salaries, tractor parts, etc., was less than $10.000. or 11¢ per capita (population approximately 85, 000).

N. DISPOSAL - Sanitary Landfill contd.

Weaver, Leo

163. THE SANITARY LANDFILL: The American City, Part I, 71:3:123, March 1956; Part II, 71:4:132, April 1956; Part III, 71:5:134, May 1956.

A three-part series encompassing a comprehensive review of design, operational, and economic criteria of the sanitary landfill method.

(Disposal - Sanitary Landfill)

SEE ALSO NOS. 1, 8, 10, 11, 13, 14, 18, 19, 20, 27, 28, 32, 33, 35, 43, 44, 47, 51, 52, 55, 60, 65, 66, 96, 126.

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